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» » A Few Antiques » »

THE most precious physical possession of man is water. Of course, this is a truism but its poignancy is felt even today by many highly-civilized communities.

But what was the evolution of the modern systems that now supply our needs at the turning of a tap? Let us see what Thomas Ewbank says about ancient methods of raising water (which is the fundamental problem of all except gravity supplies).

Ewbank has been quoted twice before in these columns, once in a description of Joseph's well, and again in the "miracle" of the Vestal Virgin and the sieve of water. He published a comprehensive treatise in 1842, in New York, under a half-page title which can be best condensed to "Hydraulics and Mechanics". It may be found in the Engineering Societies Library in New York.

In the beginning, man prostrated himself beside a pool and drank as do the beasts. However, there was a tactical advantage in raising the water either in the cupped hand or in a gourd. The latter vessel also permitted the water to be carried away. In time, yokes were developed for easing the work and whole animal skins were utilized for greater capacity.

Where the water surface was difficult of access, a cord attached to the gourd or skin-bucket increased the range. A stick with a hooked end, called a cistern pole, served the same purpose. The cord and leather bucket, however, formed part of the impedimenta of every traveller because of its portability as well as its universal necessity.

An interesting modification of the cord-and-bucket is the Egyptian vessel with four cords operated by two men who sway alternately toward and away from each other and easily perform lifts of two or three feet. The basin is emptied by a dexterious twist of the cords.

Man did not confine his abode to the borders of lakes or rivers. As soon as he learned to seek water below the ground he dug wells and found that it was easier to reach the water lever with a pole or rope than by climbing down and up again. Some of the ancient wells were quite deep, one hundred feet being not uncommon, even through solid rock.

That ropes were a common agent is shown by the deep grooves cut in many ancient well-curbs by the

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A Generous Response

IN March, a distress signal was displayed in these columns to the effect that no copy of vol. 88 of *Transactions* was available for an engineering reference library in China.

It is a pleasure to report that five members responded with the contribution of their copies, so that one volume was immediately dispatched to the Orient. Since then two other copies have been placed in deserving hands, and two have reverted to the stock supply for emergencies.

The donors have been thanked individually, but they also deserve public appreciation of their practical assistance to fellow-members of the profession.

Ride, Drive or Fly to Cleveland

July 9-10-11

CLEVELAND will be host to the Society at its Annual Convention to be held July 9, 10 and 11.

It is fortunate that the Society is holding its meeting in Cleveland at this time, for its members can see and study at first hand the $100,000,000 terminal development now nearing completion as a part of the Van Sweringen brothers' vast railroad transportation system. In addition to technical papers and discussions dealing with its engineering and construction features, an entire day has been set aside for a trip over this project by special train and bus, inspecting not only the terminal itself but also the railroad construction and electrification, the rapid transit system and the suburban developments.

Whether you "believe it or not", it has been claimed that the Goodyear-Zeppelin Air Dock in Akron, Ohio, is so big that clouds will form in it and rain will fall. At any rate, the program of the meeting includes papers on the design and construction of this building which covers the largest single floor area ever placed under one roof. There will be also an inspection trip to Akron to see the structure and the enormous airship now being built in it by the Goodyear-Zeppelin Corporation for the U. S. Navy.

These are but two of the features of this meeting. Sessions of the City Planning, Construction, Sanitary Engineering, Structural, and Waterways Divisions have been scheduled, with unusually interesting subjects of national interest for discussion.

The social functions for the members and their wives assure the maximum of good fellowship at this meet-

ing. The ladies will, of course, join the men in the terminal development inspection trip, including luncheon at the beautiful Shaker Heights Country Club. Similarly, a special train will take the entire party direct to the Air Dock in Akron where luncheon will be served in the building.

With the dinner and entertainment on the evening of July 9, the dinner and dance the following evening, and the ladies' own luncheons, teas and other special entertainments, there will be few if any idle moments for anyone during the Convention.

Many members and their families are already planning to attend as a part of their summer vacation. Considering the excellent highways centering in Cleveland, the thousand-acre municipal airport with passenger lines radiating in all direction, the Great Lakes steamship routes, the steam railroads, the electric railways and the interstate bus lines—who could ask a wider option on facilities of transportation to Cleveland for the Convention.

Inspection Trips

SOCIETY Headquarters is a convenient rallying point for parties of engineering students intent upon inspection trips in and about New York. The facilities of the building and the possible assistance of the staff in arranging itineraries are apparently fairly well known to these groups.

In December, a party of a dozen men from the University of Mississippi, accompanied by Prof. G. E. Tomlinson, Junior, concluded a two-weeks' tour of engineering projects by spending three days in minute examination of bridges, subways, railroad terminal facilities and buildings within the metropolitan area.

Likewise, in early April a party of eight Syracuse University students, under the guidance of Prof. E. F. Berry, Member, devoted two days to similar inspections as the climax to a week's trip. Just as this bulletin is being mailed out, the annual three-day visit from the Union College students is in progress. The group is accompanied by Prof. W. C. Taylor, Member.

The advantage of such trips to the student is too obvious for comment. The staff at Headquarters is always ready to help with the arrangements.

The Parshall Flume

THE first description of a Venturi flume in America was by Mr. V. M. Cone in 1917. The device had been used in the Punjab, India, by Messrs. Stoddard and Harvey of the Irrigation Department some time before 1914, although the object for which it was developed was control rather than measurement.

Early in 1915 tests were conducted on a water-measuring device having a converging inlet, straight throat section, and a diverging outlet, with a level floor throughout. These tests resulted in Mr. Cone's report. They were followed by another and more extensive series on the same type by R. L. Parshall and Carl Rohwer, Associate Members, reported in 1921.

In 1925 the Special Committee on Irrigation Hydraulics selected the subject of "Measuring Irrigation Deliveries" as one of ten for study and research. Mr. Parshall then submitted a paper on "The Improved Venturi Flume", which on recommendation of the Committee, was published by the Society.

The improvements devised by Mr. Parshall since 1921 included changes in the angles of convergence and divergence, which produced greater stability in the water surface, and the inclusion of a dip in the floor at the throat section permitting the formation of a hydraulic jump down stream from that section.

In discussing the paper, E. W. Lane, Member, remarked: "The most interesting feature of the new flume is that the principle on which it acts . . . is not the same as in the true Venturi flume or Venturi meter. The new flume is really a trough with a free drop at the end and a device for converting the resulting velocity of the water back into head. . . . Although the author does not seem to have appreciated that a new principle is involved there is no reason why this flume may not be named for the originator and the name Venturi dropped."

In December, 1929, the Special Committee on Irrigation Hydraulics unanimously adopted a resolution proposing to change the name from "Improved Venturi Flume" to "Parshall Measuring Flume". This had been done with the approval of S. H. McCrory, Member; of Prof. W. W. McLaughlin, of the U. S. Department of Agriculture; and of C. A. Lory, President of Colorado Agricultural College. All of these men were connected with the several series of tests.

Finally, the matter was submitted to Clemens Herschel, Honorary Member, for his opinion as the inventor of the Venturi meter. His reply, dated January 24, 1930, (just five weeks before his death) says: "I am glad to have the opportunity to say that I consider the action of the Committee extremely well founded. Or, to put it another way, the Society should hasten to take the opportunity to be fair to all concerned by markedly and officially designating this measuring device as the 'Parshall Measuring Flume' (and nothing else)."

The occasion seems to warrant a whole-hearted acknowledgment to an engineer of the value of his work. It is attested by an authorized group of experts on the subject. There remains but the general acceptance of the term "The Parshall Flume" to render it definite.

Engineers' Day

THE practice of devoting one day a year to demonstrations of the work of engineering students seems to be fairly wide-spread throughout the engineering schools of the country.

This custom serves several admirable purposes. The student in other courses has a chance to see interesting details of the training of engineers, and also is given a chance to absorb a slightly more accurate idea of what engineers do besides surveying. Further, it is a good thing for the engineering student to play the host to his college mates and any other interested guests at this "open house".

It would be interesting to know how many engineering schools observe this custom, and what reaction is obtained from their guests. There is opportunity here for much ingenuity in showmanship as well as for the exercise of social talents. From the point of view of the engineering student, his guest and the profession, there is much to be gained from each observance of "Engineers' Day".

On To Cleveland
July 9, 10, 11

Teaching Teachers

CIVIL Engineering is the topic for study at the Summer School for Engineering Teachers at Yale in July. This is one of the regular programs provided under the auspices of the Society for the Promotion of Engineering Education, but is the first to be devoted entirely to Civil Engineering.

Members should be aware that this session is very properly sponsored by the American Society of Civil Engineers. An advisory committee of the Society has been actively at work with the S.P. E.E. for several months. The Portland Cement Association and the Highway Education Board have also collaborated in supporting the session and in advising concerning the program. The list of 50 instructors, from all parts of the country, is truly impressive.

The session will begin on July 1 and end on the 23rd. Three days will be spent at the Yale Engineering Camp, and one day (the last) inspecting engineering works in progress in New York. The remaining days will be spent on the campus at New Haven.

One part of the session will be common to all of the one-hundred fortunate members of the course, while the other part will be divided according to special interest.

The three latter groups are structural, sanitary and hydraulic, and highway engineering. The general portion of the progam will deal with principles and methods of teaching, aims and purposes of civil engineering education, professional ethics and practices, engineering materials, and so forth.

Inquiries as to details should be addressed to Professor H. P. Hammond, Director of Summer Schools, S.P.E.E. 99 Livingston Street, Brooklyn, N. Y. Teachers of Civil Engineering topics who may desire to attend should lose no time in making application, as the enrollment will be held strictly to one hundred.

A Problem in Printing

NO little comment has been caused by the appearance in the January, 1930, issue of *Proceedings,* in connection with a paper by C. S. Jarvis, Member, entitled "Rainfall Characteristics and Their Relation to Soil Run-Off", of a certain table, long and detailed, and guilty of many faults according to its critics.

The particular form given was chosen only after a geat deal of study and by the elimination of all other solutions that had been suggested. Basically, the problem was to give all the numerical details for each geographical station on a single page or pair of opposite pages. Inasmuch as 61 items for each station were included, a little simple arithmetic will indicate that the readings have to become extremely small in type size. Further use of the slide rule will develop the fact that for 820 stations considered and 61 items per station (neglecting blanks) and with an average of three numerals per item, a total of 150,000 printed characters are required.

Faced with this proposition, the Society printer abjectly pleaded "nolo contendere" and politely wished the job on any one else who could be coërced into taking it. So much type, in one size, he protested, simply was not available.

However, a solution finally appeared. It was accomplished in this wise: the entire table was set up not by hand but on a linotype machine, which recognizes no limitation in the total characters involved; then the dividing column lines were inserted by a draftsman; and finally each page of the table was reproduced photographically to bring it down to the size required by a page of *Proceedings.* Although small, each separate numeral is typographically sharp and distinct.

The substitute usually suggested for this most detailed table is the use of folding inserts for each page. Such a form might appeal to an organization with unlimited resources. As a matter of fact, the table in its present state cost almost $1,000; in the expanded form, it would have cost nearly $4,000, or about 10% of the entire yearly budget of *Proceedings.* Such prohibitive cost, by the way, is the main reason why folding plates are ruled out of Society publications.

Probably every engineer faced with this alternative could quickly pick the lesser of the two evils involved.

Employment Service

NOW is the time for all young men—graduating this spring in civil engineering schools—to look for their first jobs. The Profession welcomes them into its ranks, and hopes to make a good fit for each individual.

A practical welcome can be made immediately by advising the Employment Service, 31 W. 39th St., New York, as to positions open or about to become open to these young men. It

◆ ◆ Miscellany ◆ ◆

Students who are about to graduate from engineering schools of recognized standing and who are considering affiliation with this Society, should note the following:

1. That a graduate joining within two months of his graduation secures exemption from one year's dues (that is, pays only the entrance fee).
2. That he needs only two endorsers.
3. That he must not send in his application until after graduation, as he is not eligible until that date.

At Society Headquarters on Tuesday, March 18, 1930, a meeting was held to draft a uniform registration law for engineers. There were present accredited representatives of the American Society of Civil Engineers, American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Association of Engineers, New York State Society of Professional Engineers and Land Surveyors, and the National Council of State Boards of Engineering Examiners.

It was voted unanimously to recommend the adoption and endorsement of this Recommended Uniform Registration Law for Professional Engineers and Land Surveyors by all national, state and local organizations of engineers as a model to be followed in the framing of all new registration laws and the amending of existing laws, with a view to attaining a uniform high standard throughout the United States.

Completing the roster of college gatherings at the time of the last Annual Meeting, report should be made of the Harvard-Yale-Princeton Engineering Societies' joint meeting at the Westinghouse Lighting Institute. Three hundred members packed the auditorium and enjoyed special demonstrations of that permanent exhibit.

happens that the 1930 lists are lagging a bit more than in previous years, so that prompt advice as to jobs available will be extra welcome at this time.

A few figures for 1929 should prove interesting. For all of the Founder Societies, 1664 placements were made out of 3628 registrations. The civil engineers filled 306 places out of 564 registrations. The total number of positions received (requests for men) was 5084.

One is advised to be cautious in deriving percentages, because the apparently simple figures above contain devious complexities; but the total figures are nevertheless quite impressive.

Engineering teachers will be interested to know that teaching positions are now listed in the monthly bulletin of the Service under "Men Available". This is a new feature beginning with the May issue.

Finally, the Service could use right away some positions adapted to men over 40 years of age, several of whom are available just at this time.

May Proceedings

MANY fundamental or even revolutionary ideas often appear in a form so brief as to belie their importance. Such is the paper which opens the May *Proceedings* entitled "Analysis of Continuous Beams by Distributing Fixed End Moments", by Hardy Cross, Member.

Any misapprehension that this short paper contains little real meat will be dispelled by a single reading. Reams have been written about analyzing continuous frames, but never before has a solution been suggested, so fundamental, yet so simple, and at the same time accurate. A few simple physical constants are found; each span is considered rigidly fixed and the end moments determined; then by plain arithmetic the excess or unbalanced parts of the fixed moments at successive joints are distributed throughout the structure. By this method what was formerly mathematical drudgery becomes child's play in ease, accuracy, and speed.

The next paper takes Americans half-way around the world to "The Training Wall Across the Liao Bar in Manchuria", as described by P. N. Fawcett, Associate Member. This single wall was designed to improve navigation to and from the important port of Niuchuang. Details of construction and interesting data concerning tides, winds, rainfall and velocity of river flow add to the value of this paper.

In studying "Evaporation as a Function of Insolation", by Burt Richardson, Esq., insolation may be defined broady as "exposure to the rays of the sun". Mr. Richardson describes three methods of measuring evaporation: (1) by means of thermo-electric pyrheiliometers; (2) by mathematics, using the sun's radiation, altitude, etc.; and (3) by tracing the radiant heat energy that strikes the water surface of a heat-insolated tank. After detailed comparisons he concludes that the different methods check experimentally within 5% and that insolation records covering a wider area are highly desirable.

In general, "City Planning as Related to the Smaller Cities", as described by E. A. Wood, Member, follows many fundamental principles of metropolitan districts. Mr. Wood points out the essential functions of the City Planning Commission, of the City Engineer, and of the Master Plan, laying emphasis upon the popular support of any project so essential in smaller cities.

The last paper, "Silting and Life of Southwestern Reservoirs", by R. G. Hemphill, Associate Member, deals with a problem which is especially vital in the section of country considered. After describing the dangerous silting tendencies in this territory, Mr. Hemphill covers in detail the methods of investigation and tests undertaken in Texas. He concludes that each such problem should be attacked for the stream as a whole, thereby distributing costs equitably among several reservoirs or regions benefited.

In addition to these new Society papers, discussions on 18 previous papers to the number of 59 contributions from different people are included in the May issue. Finally, memoirs of 9 deceased members conclude this number.

A Few Antiques

(*Continued from page* 1)

"drawers of water". It is also interesting to note that the curbs were seldom above the level of the ground, in order to permit of easier concealment in time of war. The same reason prevented the installation of permanent machinery over many wells.

The next improvement came from balancing the cistern-pole across a support and counter-weighting the outer end, thereby producing the familar well-sweep. This scheme lightened the effort and increased production so that irrigation became practicable for even individual farmers. A seven foot lift was about the practicable limit in Egypt for continuous action. A French observer claims to have seen from 30 to 50 successive lifts at one point on the Nile.

The Hindus developed a trough device for low lifts, called a "jantu". It consists of a movable gutter with one end hinged at the discharge level and with its outer end supported out over the stream by a flexible bamboo pole. The pole is anchored securely at the inboard end and acts as a spring. The operator depresses the outer end of the gutter below the level of the stream, using his foot, and then lets the bamboo spring raise the load to the discharge position. The bamboo exerts the maximum lift at the beginning of the cycle, while the water moving shoreward in the trough reduces the effective load as the spring-pole loses its lifting power.

If a well had a smooth curb, the cord of the simple rope-and-bucket could be pulled horizontally. When pulleys made their appearance, the friction was much reduced and cattle were often used to do the work. Also a man pulling downward over a pulley worked much more efficiently. The Chinese developed a differential windlass for raising the bucket.

The next step was to attach a bucket to the pulling end of the rope and thereby not only raise water at each operation but also counter-balance the dead weight of the buckets and hence lift only water. From that point it must have required real inventive genius to connect the two ends of the rope into an endless belt, and attach several buckets at equal distances throughout its length. At any rate, the result was the chain-of-pots already described for Joseph's Well.

(*To be concluded*)